REMARKS

Claims 1, 2, 4, 7-9, 11, 13-15, 17, and 23-26 are now pending in this application. In response to the non-final Office Action mailed on November 26, 2008, claims 1, 2, 4, 7-9, 11, 13-15, and 17 are amended, claims 3, 10, 16, and 20-22 are canceled without prejudice, and new claims 24-26 are added. Support for the amendments is found in the specification, including the claims, as filed. Support is found, for example, at page 12, line 15 to page 14, line 16 of the specification. Claims 1, 8, and 14 are amended to respectively incorporate limitations previously presented in claims 3, 10, and 16. No new matter has been added. Favorable reconsideration of the application in light of the foregoing amendments and following comments is respectfully solicited.

Rejection Under 35 U.S.C. § 112, First Paragraph

In section 6 of the Office Action, claim 23 was rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. Applicants respectfully traverse.

Page 13, lines 11 to 20 of the specification as filed reads as follows:

> Cepstral analysis unit 94 further includes: a Δ cepstrum calculating unit 134 for calculating Δ cepstrum from the cepstral coefficients output from linear prediction analysis unit 130; and an inter-frame variance calculating unit 138 calculating, for every frame, variance in magnitude of spectral change among five frames including the frame of interest. An output of inter-frame variance calculating unit 138 represents a contour of distribution waveform on the time axis of local spectral movement, of which local minimum is considered to represent controlled movement (CM) in accordance with the theory of articulatory phonetics proposed in Reference 8.

Cepstrum is the inverse Fourier transform of the logarithm of the power spectrum of a signal. It is a homomorphic transformation used to separate the component due to the glottal

wave (spectral envelop) and the component due to the pitch (fine structure convoluted on the spectral envelop) of the speech signal. By Fourier transforming the cepstrum, the original spectrum can be obtained. This means that the cepstrum represents the distribution of the spectrum and the Δ cepstrum represents the change (variation) of the distribution of the spectrum; therefore, the local minimum of the spectral change can be detected from the Δ cepstrum.

Claim 23 recites that the "second portion" is estimated as a portion where local variance of changes of the frequency spectrum is at a local minimum. As discussed above, the local variance of changes of the frequency spectrum can be detected from the Δ cepstrum, which is derived from the cepstrum, which in turn is derived from the distribution of the spectrum. Thus, claim 23 is supported by, for example, the above-identified portion of the specification.

Rejections Under 35 U.S.C. § 112, Second Paragraph

In section 8 of the Office Action, claims 3, 7, 10, 13, 16, 20-22, and 23 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Applicants respectfully traverse.

As noted previously, claims 1, 8, and 14 are amended to incorporate limitations previously presented in claims 3, 10, and 16. Terms such as "distribution based on estimated value of formant frequency" are revised to recite, for example, a "distribution of cepstral distance on the time axis based on the estimated value of formant frequency." Terms such as "distribution on the time axis of local variance of spectral change" are revised to recite, for example, a "distribution of local variance of magnitude of delta cepstrum." Applicants respectfully submit that the amended claims comply with 35 U.S.C. § 112, and request withdrawal of the rejection.

In section 9 of the Office Action, claims 8-10, 11, 13, and 21 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Applicants respectfully traverse.

The Office Action objects to the use of the term "program product." The amended claims no longer recite the term "program product," but instead are directed to a "machine readable medium having data stored thereon, the data, once read by the machine, causing the machine to operate as an apparatus." Applicants respectfully submit that the amended claims comply with 35 U.S.C. § 112, and request withdrawal of the rejection.

Rejections Under 35 U.S.C. § 101

In section 11 of the Office Action, claims 1 and 7 were rejected under 35 U.S.C. § 101, with claims 2-4, 20, and 23 rejected as dependent thereon in section 12 of the Office Action. Specifically, the Office Action rejects claims 1 and 7 under Section 101 "because the claims appear to be directed to a software embodiment and not to a hardware embodiment." Applicants respectfully traverse.

Recently, in *In re Bilski*, the Federal Circuit explained that "the only limit to patent-eligibility imposed by Congress is that the invention fall within one of the four categories enumerated in § 101" (*i.e.*, "process, machine, manufacture, or composition of matter"). Independent claims 1 and 7 each fall into the machine category, reciting apparatuses comprising a plurality of components and subcomponents in a particular arrangement, and explicit interactions among said components. The recited subject matter might be implemented as a pure hardware system. Alternatively, as illustrated in FIG. 2, the claims may be embodied as a machine that executes software. However, the use of software by a machine does not render the machine ineligible for patenting. Although before the PTO claims are subject to a "broadest

reasonable interpretation," apparatus claims 1 and 7 cannot be construed as a patent-ineligible, abstract pure software algorithm. Instead, claims 1 and 7 are clearly directed to apparatuses eligible for patenting under Section 101. Thus, Applicants respectfully request withdrawal of the rejection.

In section 13 of the Office Action, claims 14-17 and 22 were rejected under 35 U.S.C. § 101 as being drawn to non-statutory subject matter, specifically a non-statutory process. Applicants respectfully traverse.

Specifically, the Office Action asserts that the recited process claims do not satisfy the new "machine-or-transformation test" recently set forth by the Federal Circuit in *In re Bilski*. To satisfy the transformation prong of the test, a process must transform an article. Recognizing that "[t]he raw materials of many information-age processes, however, are electronic signals and electronically-manipulated data," the Federal Circuit explained that where data "represented physical and tangible objects . . . the transformation of that raw data . . . was sufficient to render that more narrowly-claimed process patent-eligible. We further note for clarity that the electronic transformation of the data itself . . . was sufficient; the claim was not required to involve any transformation of the underlying physical object that the data represented."

Claim 14 is directed to a "method of extracting from a speech waveform data a portion representing a feature of the speech waveform." The claims method carries out non-abstract transformation of an article in accordance with the "machine-or-transformation test." Specifically, the recited "speech waveform data" is an article, as it represents something physical and tangible – the original speech encoded by the waveform. This article is transformed in that "a portion representing a feature of the speech waveform" is extracted from the original speech waveform data. Much in the manner that a raw material, such as an ore, may be

processed to yield a useful constituent element, the recited process likewise transforms the raw bulk speech waveform data to obtain useful portions therein. Thus, claim 14 and the claims depending thereon are eligible for patenting under Section 101, and Applicants respectfully request withdrawal of the rejection.

In section 15 of the Office Action, claims 8-11, 13, and 21 were rejected under 35 U.S.C. § 101 as being directed to a non-statutory *per se* "computer program product." Applicants respectfully traverse.

The amended claims no longer recite the term "program product," but instead are directed to a "machine readable medium having data stored thereon, the data, once read by the machine, causing the machine to operate as an apparatus." Applicants respectfully submit that the amended claims comply with 35 U.S.C. § 101 (*see, e.g.*, MPEP § 2106.01 ("a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory")), and request withdrawal of the rejection

Rejections Under 35 U.S.C. § 103(a)

In section 17 of the Office Action, claims 1, 4, 8, 11, 14, and 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Lea et al. ("Algorithms for acoustic prosodic analysis", hereafter "Lea") in view of Schafer et al. ("System for Automatic Formant Analysis of Speech", hereafter "Schafer") and Schmidbauer ("Syllable-based Segment-hypotheses Generation in Fluently spoken speech using Gross Articulatory features", hereafter "Schmidbauer"). In section 18 of the Office Action, claims 2, 9, and 15 were rejected under 35

U.S.C. § 103(a) as being unpatentable over Lea in view of Schafer, Schmidbauer, and Mermelstein ("Automatic segmentation of speech into syllabic units", hereafter "Mermelstein "). In section 19 of the Office Action, claims 3, 10, 16, and 20-23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Lea in view of Schafer, Schmidbauer, and U.S. Patent No. 5,732,392 (hereinafter "Mizuno"). In section 20 of the Office Action, claims 7 and 13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Schafer in view of Mizuno. Applicants respectfully traverse.

As noted previously, independent claims 1, 8, and 14 are amended to incorporate limitations previously recited respectively in claims 3, 10, and 16. Accordingly, the applicable bases of rejection set forth in the Office Action against each of independent claims 1, 7, 8, 13, 14 as currently presented each rely upon Mizuno (*i.e.*, the rejections set forth in sections 19 and 20 of the Office Action, whereas the rejections set forth in sections 17 and 18 are moot in view of the amendments to the claims).

Embodiments of the independent claims use both acoustic/prosodic analysis and cepstral analysis, in a new and nonobvious manner, to detect and/or extract syllabic nuclei from a speech waveform data. None of the cited art, either individually or in combination with one another, renders obvious the use of these analysis techniques in the manner recited in the claims.

Independent claim 1, for example, recites, *inter alia*,

> an inter-frame variance calculating unit which calculates, based on an output from said linear prediction analysis unit, distribution of local variance of magnitude of delta cepstrum of said speech waveform on the time axis; and
>
> a reliability center candidate output unit which estimates, based both on said distribution on the time axis based on the estimated value of formant frequency calculated by said cepstral distance calculating unit and on said distribution on the time axis of local variance of spectral change in said speech waveform calculated by said inter-frame variance calculating unit, a range in which change in the speech waveform is well controlled by said source.

Similar limitations are recited in independent claims 7, 8, and 13.

Independent claim 14 recites, *inter alia*,

> calculating, based on the calculated distribution based on the estimated value of formant frequency, distribution of local variance of magnitude of delta cepstrum of said speech waveform on the time axis; and
>
> estimating, based both on said calculated distribution on the time axis related to the estimated value of formant frequency and on said calculated distribution on the time axis of local variance of spectral change in said speech waveform, a range in which change in the speech waveform is well controlled by said source.

The Office Action alleged that Mizuno teaches a "second calculating means" as previously recited in, for example, dependent claim 3, specifically citing "col. 6, lines 29-35, delta cepstrum is obtained from LPC cepstrums as a function of time, A(t)." As recited in claim 1, for example, the inter-frame variance calculating unit calculates a "distribution of local variance of magnitude of delta cepstrum of said speech waveform on the time axis." It appears that the Office Action regards the delta cepstrum of Mizuno as equivalent to the recited "local variance." However, this is clearly wrong. Although the delta cepstrum represents a dynamic feature of the speech signal (*see* Mizuno, col. 6, lines 56-60), it does not disclose or suggest the recited "local variance" thereof. The "local variance" recited in claim 1, for example, is the local variance of magnitude of delta cepstrum calculated from the speech waveform. The "dynamic measure" discussed in Mizuno (col. 5, equations (4) and (5)) is calculated from the delta cepstrum, but merely represents the magnitude of the spectrum variation (col. 5, lines 56-60), and is not disclose or suggest the recited calculation or use of a "distribution of local variance of magnitude of delta cepstrum of said speech waveform on the time axis."

As Mizuno does not disclose or suggest at least the above limitations of the independent claims, it does not render obvious the claimed subject matter. The remaining cited references

fail to bridge this gap between the claims and Mizuno[1], thus the claims are nonobvious in view of the cited art. Accordingly, Applicants respectfully request withdrawal of the rejections under 35 U.S.C. § 103 of independent claims 1, 7, 8, 13, and 14, and the remaining claims, which each depend thereon.

Conclusion

In view of the above remarks, Applicants respectfully submit that the application is in condition for allowance, and respectfully request the Examiner's favorable reconsideration as to allowance. The Examiner is invited to contact the Applicants' representative listed below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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[1] For example, page 12 of the Office Action acknowledged "Lea in view of Schafer in view of Schmidbauer do not specifically teach the second calculating means for calculating, based on output from said linear predicting means, distribution on the time axis of said speech waveform and means for estimating, based on the distribution of nonreliability of based on the estimated value of formant calculated by said first calculating means and the distribution of variance of local spectral change in said speech waveform calculated by said second calculating means, a portion of said speech waveform in which a change in said speech waveform is well controlled by said source." Related limitations are presently recited in independent claims 1, 7, 8, 13, and 14.